The Associate Administrator for Commercial Space Transportation of the Federal Aviation Administration (FAA), Department of Transportation (DOT), published a notice of proposed rulemaking (NPRM) to amend the FAA's commercial space transportation regulations. Licensing and Safety Requirements for Launch, 65 Fed. Reg. 63921 (proposed Oct. 25, 2000). The FAA sought to develop requirements that reflect the best of current practice and lessons learned at the federal launch ranges and present them in the appropriate regulatory form to create a baseline set of FAA safety requirements. The Air Force allows a launch operator to deviate from its baseline requirements as written if the launch operator satisfies the intent of those requirements. Similarly, the FAA will permit a launch operator to demonstrate an equivalent level of safety to its baseline requirements. Flight safety analysis methods often vary from one federal launch range to another. The FAA worked with the federal range organizations to ensure that their current analysis methods provide an equivalent level of safety to the methods provided in the proposed rule. The FAA would consider a launch operator's alternative analysis methods based on their demonstration of an equivalent level of safety. The following table, which is derived from a similar table in the regulatory evaluation that accompanies the proposed rule, compares the proposed FAA safety requirements to current federal range baseline requirements and current FAA practices.

NPRM, Licensing and Safety Requirements for Launch [14 CFR Parts 401, 413, 415, 417] Comparison to Current Practice

Part/Section	Summary	Comparison
Part 415, Launch Licenses	Contains the requirements for obtaining a license to launch a launch vehicle; changes are directed at launching from a non-federal launch range.	Specific impacts, if there are any, are discussed in Subparts A - F and Appendices A and B.
Subpart A - General	Describes the scope of part 415 and types of launch licenses, and approvals and determinations, and procedures governing issuance of a license.	Editorial Changes.
Subpart D - Payload Review & Determination	Revision to clarify for FAA review of payloads subject to regulation by the FCC, NOAA, or that are owned or operated by the U.S. Government. Primarily a clarification of safety review.	**Current FAA practice**[1] for those payloads not subject to FCC, NOAA regulation or owned or operated by U.S. Govt. Also, current practice for federal ranges to perform reviews of payloads subject to FCC, NOAA regulation or owned and/or operated by U.S. Govt. FAA review for non-federal site launches would be required with/without proposed rulemaking.
Subpart E- Post-Licensing Reqm'ts - Launch License Terms & Conditions	Revision to require a licensee who places in space an object owned by a foreign entity, that licensee shall ensure by contract that the foreign entity obtains registration of each object.	Potential minor paperwork impact.
Subpart F - Safety Review for Launch from a Non-Federal Launch Site	Applies to the safety review that the FAA requires as part of the licensing process for launch from a non-federal launch site. Specifics in *§415.101 - §415.400.*	N/A
§415.101 Scope	Establishes the scope of Subpart F which contains the requirements for the application submission material to demonstrate that applicant will meet safety responsibilities and requirements for launch; also includes administrative requirements.	Specific impacts, if there are any, are discussed in *§415.103* through *§415.400.*
§415.103 General	General statement that the FAA conducts safety reviews in accordance with requirements of part 417. FAA advises an applicant in writing of its findings.	**Current FAA Practice.** This is a general statement that the FAA will conduct safety reviews and will provide its findings in writing. It is FAA current practice to conduct safety reviews and to inform applicant in writing of results.

[1] *14 CFR Parts 401 et al., Commercial Space Transportation Licensing Regulations; Final Rule*, **Federal Register**, April 21, 1999. Paragraph 415.53 of Subpart D delineates the payloads not subject to FAA review.

NPRM, Licensing and Safety Requirements for Launch [14 CFR Parts 401, 413, 415, 417]
Comparison to Current Practice [Continued]

Part/Section	Summary	Comparison
§415.105 Pre-Application Consult,	Requirement that an applicant conduct at least one pre-application consultation meeting with the FAA when planning to apply for a new launch license & provides requirements for the data to be presented.	**Current practice by the FAA.**[2] Would be required with/without proposed rulemaking.
§415.107 Safety Review Document	Requires applicant prepare a "safety review document" for the FAA to conduct launch safety review. Specific requirements are provided in *§415.109 - §415.131.* Final document would be used by licensee & FAA for ensuring the implementation of a launch safety program that protects public safety in accordance with Part 417.	Specific impacts, if there are any, are discussed in *§415.109* through *§415.131.* Cost savings impact on FAA due to efficiencies from using standardized form and content in the licensing review & approval process. Cost savings impact on applicants as a result of clarified and specified requirements.
§415.109 Launch Description	Identifies data required to describe proposed launch that must be submitted to FAA as part of safety review document.	**Current FAA and federal range practice**. Would be required by FAA with/without proposed rule.
§415.111 Launch Operator Info.	Ensures that a launch operator applicant's administrative information [i.e., organization data] is submitted prior to or as part of safety review application	**Current practice by FAA**[3] **and at federal ranges**. Would be required by FAA with/without proposed rulemaking.
§415.113 Launch Personnel Certification Program	Requires applicant to submit information on its launch personnel certification program [as per *§417.105*] - including identification by position of those individuals who implement the program and a table listing each safety critical task that must be performed by certified personnel.	**Current practice by FAA and at federal ranges**. Would be required by FAA with/without proposed rulemaking. Organization requirements are flexible with the the result that there are unlikely to be impacts on small entities.
§415.115 Flight Safety	Requires applicant to submit information related to program for protecting the public from hazards associated with the flight of a launch vehicle; perform flight safety analysis [as per Part 417]; demonstrate ability to operate a launch vehicle that uses a flight safety system to protect public safety or to operate a launch vehicle without a flight safety system in such a manner that it is not physically capable of reaching any populated or other protected area; to submit data for a conjunction on launch assessment; to provide information relating to radionuclide material; to submit a flight safety plan.	**Current practice by FAA and at federal ranges**. With the proposed rulemaking, much of the effort would be shifted from the federal range to the launch operator. However, this would be required by the FAA with/without the proposed rulemaking.
§415.117 Ground Safety	Requires an applicant to submit a ground safety analysis report that identifies potential public hazards and the controls to be implemented to protect the public from each hazard.	Work load will increase for FAA for first few licensees to eliminate overlap with other regulatory agencies. Also will increase operator cost because of lack of clarity with respect to OSHA & FAA interface. However, these cost increases are the result of the need to ensure safety with/without the proposed rulemaking.

[2] *14 CFR Parts 401 et al., Commercial Space Transportation Licensing Regulations; Final Rule*, **Federal Register**, April 21, 1999. [Paragraph 413.5]
[3] *14 CFR Parts 401 et al., Commercial Space Transportation Licensing Regulations; Final Rule*, **Federal Register**, April 21, 1999. [Paragraph 413.7]

NPRM, Licensing and Safety Requirements for Launch [14 CFR Parts 401, 413, 415, 417]
Comparison to Current Practice [Continued]

Part/Section	Summary	Comparison
§415.119 Launch Plans	Requires applicant to submit a series of launch plans and supplemental plans [i.e., emergency response plan, frequency management plan, security plan, launch abort or delay recovery plan, etc.]. The operator's launch plans document the operator's approach for compliance with the requirements.	**Current practice by FAA and at federal ranges** to require such reports. With the proposed rule-making, much of the effort would be shifted from the federal range to the launch operator and to the FAA. However, this would be required by the FAA with/without the proposed rulemaking.
§415.121 Launch Schedule & Points of Contact	Requires that an applicant submit schedule charts and points of contact for the tests, review, rehearsals, and launch safety operations to be conducted [per Part 417]	**Current practice by FAA and at federal ranges**. This would be required by the FAA with/without the proposed rulemaking.
§415.123 Computing Systems and Software	Requires applicant to submit material that describes computing systems and software that perform a soft-ware safety critical function.	**Current practice at federal ranges** and would be required with/without proposed rulemaking.
§415.125 Unique Safety Policies and Practices	Requires applicant to identify any public safety related policy and practice unique to the proposed launch.	**Current practice at federal ranges** and would be required with/without the proposed rulemaking. Unique policies and practices, by their very nature, cannot be identified in advance so if there are impacts they would not be quantifiable at this time.
§415.127 Flight Safety System Data	Identifies data that an applicant must submit to describe any flight safety system to be employed during launch and to participate in related meetings.	**Current practice at federal ranges** and would be required with/without proposed rulemaking.
§415.129 Flight Safety System Testing Data	Identifies the test data that an applicant must submit on flight safety system to be employed during a launch.	**Current practice at federal ranges** and would be required with/without proposed rulemaking.
§415.131 Flight Safety Crew Data	Requires applicant to identify each flight safety crew position, functional roles during launch operations, and to describe the certification & training program for flight safety crew.	**Current practice at federal ranges** and would be required with/without proposed rulemaking.
Part 415 Appendix B, Safety Review Document Outline	Contains format and content requirements for a safety review document. Technical requirements related to the information contained in the document are provided in Part 417. Intent is to standardize reporting and is aimed at reducing differences in evaluation process and reducing FAA time and costs .	Specific impacts, if there are any, are discussed in *§417.101* through *§417.415.* FAA and applicant costs will increase because of a change in who bears the costs as a result of launching from non-federal launch sites. This would be the case with/without proposed rulemaking. However, there will be a Cost savings impact on the FAA due to efficiencies from using standardized outline & content in the safety review document. Cost savings impact on applicant due to better understanding of FAA information requirements.

NPRM, Licensing and Safety Requirements for Launch [14 CFR Parts 401, 413, 415, 417] Comparison to Current Practice [Continued]

Part/Section	Summary	Comparison
Part 415 Appendix C, Ground Safety Analysis Report	Provides the general format and content requirements for a ground safety analysis report in accordance with. *§415.117.*	**Federal ranges require similar and additional information** to be **provided, and is thus current practice** and would be required with/without proposed rulemaking. FAA requires info pertaining to public safety whereas federal ranges require broader safety info. Main difference relates to format of report which will have little or no impact on cost. However, cost savings are likely to result by providing applicant a better understanding of FAA information requirements.
C415.1 General	Provides the general format and content requirements for which will be maintained and updated by the applicant. Must contain the hazard analyses.	
C415.3 Ground Safety Analysis Report chapters	Provides a description of administrative items and requirements for launch vehicle and operations summary, detailed systems information, hazard analysis and supporting data	
Systems & Operations Info.	Presents requirements for identifying all flight & ground hardware including flight safety system and hazardous materials.	
Hazard Analysis Form	Requires the development of a standard form indicating hardware or operation and related hazards and effects, hazard causes, hazard controls and safety verifications.	
Part 417 - Launch Safety	Establishes specific launch safety and operational reqmts that must be met to obtain & maintain a launch license.	Impacts discussed in following sub-paragraphs.
Subpart A - General	Contains general top level requirements applicable to launch safety.	N/A
§417.1 Scope	Prescribes the responsibilities of a launch operator conducting a licensed launch and the requirements that a licensed operator must comply with to maintain a license and conduct a launch.	**Required by statute and is current FAA practice** as demonstrated by the licensing of Sea Launch.
§417.5 Launch Safety Responsibility	Requires that a launch operator ensure the safe conduct of a licensed launch.	**Required by statute and is current FAA practice** as demonstrated by the licensing of Sea Launch. Would be required with/without proposed rulemaking.
§417.7 Launch Site Responsibility	Requires a launch operator to ensure the safe conduct of preflight preparation of its launch vehicle at a launch site in the U.S. For a launch conducted from an exclusive use site where there is no separate launch site operator, requires the launch operator licensee to be responsible for safety.	**Required by statute and is current FAA practice.** Would be required with/without proposed rulemaking.
§417.9 Safety Review Document	Requires a launch operator to conduct each launch in accordance with the safety review document developed during the licensing process of Part 415 and requires changes and updates to be submitted for approval before each flight.	**Current practice at federal ranges and by FAA** and would be required with/without proposed rulemaking.

NPRM, Licensing and Safety Requirements for Launch [14 CFR Parts 401, 413, 415, 417]
Comparison to Current Practice [Continued]

Part/Section	Summary	Comparison
§417.11 Launch License Readiness Statement	Requires a launch operator to provide the FAA with a written launch license readiness statement.	**Current practice at federal ranges** [similar to "Launch Readiness Certificate"] and would be required with/without proposed rulemaking.
Subpart B - Launch Safety Reqm'ts	Contains launch safety requirements that apply to launch of orbital and sub-orbital expendable launch vehicles.	Specifics are discussed in *§417.101 - §417.127.*
§417.101 Scope	States that Subpart B contains requirements that apply to the launch of orbital and sub-orbital expendable launch vehicles.	Specifics are discussed in *§417.101 - §417.127.*
§417.103 Launch Operator Organization	Requires a launch operator to maintain an organization that ensures public safety [as per reqmts of Part 417].	**Current practice.** Federal ranges have organizations in place that perform the required functions and is already a requirement in 14 CFR.[4] Would be required with/without proposed rulemaking.
§417.105 Launch Personnel Qualifications & Certification	Requires the launch operator to identify and document launch personnel qualifications and requires the launch operator to implement a certification program including the need to re-certify annually. Required qualifications are stated in *§417.343.*	**Current practice.** Federal ranges have organizations that perform these functions and is already a requirement in 14 CFR.[5] Though not specifically covered by current FAA regulations, Sea Launch provided a certification plan. Requirement for annual certification established by FAA; AF does not have a requirement for this but normally re-certifies at least annually. Would be required with/without the proposed rulemaking.
§417.107 Flight Safety	Specifies requirements for protecting the public from the hazards associated with the flight of a launch vehicle.	
	[a] Requires a launch operator to perform and document a flight safety analysis according to Subpart C.	[a] Impacts considered in Part C.
	[b] Specifies that launch operator must demonstrate compliance with both collective and individual risk criteria through analysis.	[b] **Current practice.** Both collective and individual risk are considered at federal ranges and collective risk is considered in FAA licensing. Consideration of both collective & individual risk are considered as current practice and would be required with/without proposed rule-making.
	[c] Requires launch operator ensure safety of inhabitable orbital objects throughout a sub-orbital launch and obtain a conjunction on launch assessment from US Space Command.	[c]**Current practice at federal ranges.** Would be required with/without proposed rulemaking.

[4] . *14 CFR Parts 401 et al., Commercial Space Transportation Licensing Regulations; Final Rule*, **Federal Register**, April 21, 1999. [Subpart C, Paragraph 415.33]
[5]. Ibid.

NPRM, Licensing and Safety Requirements for Launch [14 CFR Parts 401, 413, 415, 417] Comparison to Current Practice [Continued]

Part/Section	Summary	Comparison
	[d] Requires that the launch of any radionuclide be approved by the FAA as part of the licensing process.	[d] **Current practice by federal ranges and by the FAA**. Would be required with/without proposed rulemaking.
	[e] Requires a launch operator to implement a flight safety system to protect the public.	[e] **Current practice by federal ranges and by the FAA**. Would be required with/without proposed rulemaking.
	[f] Requires a launch operator to implement a flight safety plan.	[f] **Current practice at federal ranges** [by USAF] and would be required with/without proposed rulemaking.
§417.109 Ground Safety	Places responsibility for public safety of operations and support systems on launch operator and requires launch operator to perform ground safety analysis & implement a ground safety plan [specific requirements are indicated in Subpart E].	The performance of safety analyses and implementation of safety plans are **current practice at federal ranges** and would be required by the FAA in order to achieve safety requirements with/without proposed rulemaking.. Impact implications of specific requirements are discussed in subpart E.
§417.111 Launch Plans	Requires a launch operator to implement a flight safety plan and a ground safety plan both of which to be updated to reflect changes. Plan content requirements are described in Subpart F of Part 415.	The implementation of flight and ground safety plans are **current practice at federal ranges** and would be required by the FAA in order to achieve safety requirements with/without the proposed rule-making. Impact implications of specific requirements are discussed in subpart F.
§417.113 Launch Safety Rules	[a} Requires a launch operator to implement written safety rules that govern launch operations including environmental conditions, status of launch vehicle, launch support equipment and personnel. [b] Requires written flight commit criteria that identify the conditions that must be met to initiate flight and must document the actual conditions at time of liftoff. [c] Specifies flight termination rules. For a launch vehicle with a FTS, requires implementation of a set of written rules that specify the conditions under which a flight termination action would be initiated. [d] Requires implementation of written rules governing crew rest.	**Current practice at federal ranges**. With the proposed rule-making, much of the effort would be shifted from the federal range to the launch operator. The same activities would be performed but by different parties and would result in cost transfers from the federal ranges to the applicant and to the FAA. However, this would be required by the FAA with/without the proposed rulemaking.
§417.115 Tests	Requires a launch operator to implement a test program for flight and ground equipment that protects the public; this includes implementing a flight safety system test plan, a ground system test plan, and a communication systems test plan.	**Current practice at the federal ranges** and would be required by the FAA with/without proposed rulemaking.
§417.117 Reviews	[a] Requires launch operator to conduct review meetings.	**Current practice at the federal ranges**. Requirement would be implemented with/without the proposed rulemaking.

NPRM, Licensing and Safety Requirements for Launch [14 CFR Parts 401, 413, 415, 417] Comparison to Current Practice [Continued]

Part/Section	Summary	Comparison
§417.117 Reviews (continued)	[b] Requires launch operator to conduct a review prior to performing hazardous operation.	Formalizes the federal review practice and is **considered as current practice**. Requirement would be implemented with/without the proposed rulemaking.
	[c] Requires launch operator to conduct a flight termination system design review.	**Current practice** and would be required with/without proposed rulemaking.
	[d] Requires launch operator to conduct a flight safety analysis review.	**Current practice** and would be required with/without proposed rulemaking.
	[e] Requires launch operator to conduct a ground safety analysis review.	**Current practice** with AF and launch operators performing the reviews. Would be required with/ without proposed rulemaking.
	[f] Requires launch operator to conduct a launch safety review at least 15 days prior to flight.	**Similar to the flight readiness review which is current practice** but concentrates on safety and not mission. Would be required with/without proposed rulemaking.
	[g] Requires launch operator to conduct a launch readiness review within 48 hours of first flight attempt.	**Current practice at the federal ranges** and would be required with/without proposed rulemaking.
	[h] Requires launch operator to conduct a post-launch review within 48 hours of launch completion.	**Current practice at the federal ranges** and would be required with/without proposed rulemaking. Sea Launch was asked by the FAA to have a post-launch review.
§417.119 Rehearsals	Requires launch operator to conduct rehearsals designed to exercise the launch crew and systems and includes countdown, launch abort/delay recovery, emergency response, and communications rehearsals.	**Current practice at the federal ranges** and would be required with/without proposed rulemaking Sea Launch was asked by the FAA to conduct rehearsals designed to exercise launch crew and systems.
§417.121 Safety Critical Preflight Operations	Requires a launch operator to identify and perform safety critical operations which provide the public protection from adverse effects from hazards associated with launch preparation and flight. Activities of concern are- countdown, collision avoidance, meteorological data, local notification, hazard area surveillance, flight safety system preflight tests, and sounding rocket preflight operations.	**Current practice at the federal ranges** and would be required with/without proposed rulemaking.
§417.123 Computing Systems & Software	Requires that computing systems and software systems are implemented according to Appendix H.	**Current practice at the federal ranges** and would be required with/without proposed rulemaking.
§417.125 Launch of an Unguided Suborbital Rocket	[a] Establishes the requirements for the launch of an unguided suborbital rocket [sounding rocket]. [b] Allows a sounding rocket to be launched without a flight safety system if it cannot reach any populated or protected areas; and, when populated or protected areas can be reached identifies safety requirements. [c] Requires that a launch be conducted in accordance with the public risk criteria I *§417.107.* [d] Requires that unguided suborbital rocket be stable and defines stability.	Requirements [a], [b], and [d] through [h] are **current practice at federal ranges** [White Sands and NASA WFF] and [c] is current practice at NASA WFF unguided suborbital rocket launches. These requirements would be required by the FAA with/without the proposed rulemaking.

NPRM, Licensing and Safety Requirements for Launch [14 CFR Parts 401, 413, 415, 417]
Comparison to Current Practice [Continued]

Part/Section	Summary	Comparison
	[e] Requires a launch operator to ensure that a flight safety analysis is performed according to Subpart C. [f] Requires launch operator to ensure certification of personnel involved in the launch. [g] Requires a launch operator to implement a flight safety plan. [h] Requires that a launch operator perform a post-launch review and specifies the content of the review.	
§417.127 Unique Safety Policies & Practices	Requires the launch operator to review operations, designs, etc., and identify and implement any additional policies and practices needed to protect the public.	**Current practice at federal ranges** and would be required with/without the proposed rulemaking.
§417.128 -417.200 [Reserved]	Sections reserved for future use.	N/A
Subpart C - Flight Safety Analysis		
§417.201 Scope	Provides requirements for performing flight safety analysis in accordance with *§417.107* and identifies analysis products.	Specific impacts, if there are any, are discussed in *§417.203* through *§417.235*. **The FAA's intent is for all the analyses in subpart C to provide a functional equivalent to that which is practiced at the federal ranges.**
§417.203 General	[a] Requires a launch operator to perform flight safety analysis to demonstrate capability to monitor and control risk. [b] Requires flight safety products be incorporated in a launch operator's safety plan. [c] Requires license applicant to perform flight safety analysis and submit analysis products to the FAA. [d] Requires a six-month flight safety analysis and analysis products to be submitted to the FAA. [e] Requires a flight safety analysis update no later than 30 days prior to flight. [f] Requires a flight safety analysis for ELVs whether or not a flight safety system is used. Specific requirements are indicated in *§417.217, §417.227, §417.233,* and *§417.235.* [g] Requires launch operator to make sure analyses are compatible with each other. [h] **Allows launch operator to use alternate analyses of an equivalent level of safety**.	**Current practice at federal ranges**. In addition, Sea Launch, as part of the licensing process, was asked to provide the indicated analyses and analysis products. Would be required with/ without the proposed rulemaking. At federal ranges much of the analysis work is performed by the range organization. For launch from a non-federal site, this work would have to be performed by the launch operator or its subcontractors. Also, the analysis methods and terminology may vary from one range to another.
§417.205 Trajectory Analysis	Requires a launch operator to perform trajectory analyses to determine nominal and three-sigma dispersion trajectories and other related trajectory analyses	**Current practice at the federal ranges** with analyses performed based upon data provided by the launch operator. There will be a shift in effort from the federal range to the launch operator. This would be the case with/without proposed rulemaking since the requirement would be imposed by the FAA with/ without the proposed rulemaking.
§417.207 Malfunction Turn Analysis	Requires a launch operator to perform a malfunction turn analysis and to submit reports to the FAA.	**Current practice at the federal ranges**. There will be a shift in effort from the federal range to the launch operator. This would be

NPRM, Licensing and Safety Requirements for Launch [14 CFR Parts 401, 413, 415, 417] Comparison to Current Practice [Continued]

Part/Section	Summary	Comparison
		the case with/without the proposed rulemaking since the requirement would be imposed by the FAA with/ without the proposed rulemaking.
§417.209 Debris Analysis	Requires a launch operator to perform a debris analysis that identifies inert, explosive and other hazardous launch vehicle debris resulting from a launch vehicle malfunction and from any planned jettison of launch vehicle components & to provide reports of the analysis to the FAA.	**Current practice at the federal ranges** with launch operator working with the AF. There will be a shift in effort from the federal range to the launch operator. This would be the case with/without the proposed rulemaking.
§417.211 Flight Control Lines	Requires a launch operator to perform an analysis to determine the geographic placement of flight control lines that define the region over which a launch vehicle will be allowed to fly and to submit a report to the FAA.	**Current practice at federal ranges** and has been performed by the Air Force. There will be a shift in effort from the federal range to the launch operator. This would be the case with/without the proposed rulemaking because the requirement would be imposed with/without proposed rulemaking.
§417.213 Flight Safety Limits	Requires a launch operator to perform a flight safety limits analysis to establish when a malfunctioning launch vehicle's flight must be terminated and to submit a report to the FAA.	**Current practice at the federal ranges**. Would be required with/without proposed rulemaking.
§417.215 Straight-Up Time	Requires a launch operator to perform a straight-up time analysis to determine the latest time-after-liftoff by which flight termination must be initiated were a launch vehicle to malfunction and fly a near-vertical trajectory rather than a normal trajectory.	**Current practice at federal ranges** and would be required with/without proposed rulemaking.
§417.217 Wind Analysis	Requires a launch operator to perform a wind analysis for both launch and for jettisoned debris. Additional analysis [*§417.239*] must be performed for suborbital launches and results reported to the FAA.	**Current practice at federal ranges** and is a coordinated activity of the launch operator and the AF. The proposed rulemaking would shift the burden to the launch operator but this would be the case with/without proposed rulemaking. Would be required with/without the proposed rulemaking.
§417.219 No-Longer-Terminate Gate Analysis	Requires a launch operator to perform an analysis to determine the portion of a flight control line, or other flight safety limit boundary, through which a launch vehicle's tracking icon is allowed to proceed. A gate would be permitted for planned flight over a populated or other protected areas only if the launch could be accomplished while meeting the public risk criteria as determined by risk analysis. Results of the analysis would be reported to the FAA.	**Current practice at federal ranges** for launch vehicles that employ a flight termination system. The FAA has already set up procedures and requirements for launch vehicles that do not use a FTS and have accordingly licensed Sea Launch. This requirement would be imposed by the FAA with/without the proposed rulemaking.
§417.221 Data Loss Flight Time	Requires a launch operator to perform a data loss flight time analysis to determine the shortest elapsed thrusting time during which launch vehicle can move from a state where it does not endanger any populated or other protected area to a state where endangerment is possible, & when endangerment is no linger possible.	The proposed requirements provide **a functional equivalent to that which is current practice at the federal ranges**. This requirement would be imposed by the FAA with/without proposed rulemaking.

NPRM, Licensing and Safety Requirements for Launch [14 CFR Parts 401, 413, 415, 417]
Comparison to Current Practice [Continued]

Part/Section	Summary	Comparison
§417.223 Time Delay Analysis	Requires a launch operator to perform a time delay analysis to determine the elapsed time between start of a launch vehicle malfunction and the final commanded flight termination and to provide analysis products to the FAA.	**Current practice at federal ranges** and would be imposed by the FAA with/without the proposed rulemaking.
§417.225 Flight Hazard Areas	Requires a launch operator to perform a flight hazard area analysis to determine the land, sea, and air regions that must be publicized, monitored, controlled, or evacuated in order to protect the public from the adverse effects of hazards resulting from the launch and to provide the results of analyses to the FAA.	**Current practice at federal ranges**. The FAA has licensed Sea Launch to launch from a remote area of the oceans and has approved method for establishing ship hazard areas. These requirements would be imposed by the FAA with/without proposed rulemaking.
§417.227 Debris Risk Analysis	Requires a launch operator to perform a debris risk analysis to determine the expected average number of casualties [E_c] to the public exposed to inert and explosive debris hazards and provide results of analyses to the FAA. Must demonstrate that $E_c \leq 30x10^{-6}$.	**Current practice at federal ranges and FAA**. These requirements would be imposed by the FAA with/ without the proposed rulemaking.
§417.229 Toxic Release Risk Anal.	Requires a launch operator to perform a toxic release analysis to determine any public hazards from any toxic release that will occur during the proposed flight of a launch vehicle or that would occur in the event of a flight mishap. A toxic release analysis must determine the flight commit criteria that the launch operator implements for each launch to protect the public from casualties that could result from any toxic release.	**Current practice at federal ranges**. These requirements would be imposed by the FAA with/ without the proposed rulemaking.
§417.231 Distant Focus Over-pressure Blast Effects Risk Anal.	Requires that a launch operator conduct a deterministic distant focus overpressure analysis, or a statistical risk management approach to establish distant focus over-pressure hazard areas. If the public is present in the hazard area, the launch operator must determine and implement mitigation measures. Analysis products must be provided to the FAA.	**Current practice at federal ranges**. These requirements would be imposed by the FAA with/ without the proposed rulemaking.
§417.233 Conjunction on Launch Assessment	Requires that a launch operator obtain a conjunction on launch assessment performed by US Space Command and implement any identified closures in a planned launch window during which flight must not be initiated in order to maintain required separation from inhabitable orbiting objects. Requires that license applicant provide data to the FAA.	**Current practice** when launching from federal ranges. The burden would be shifted to the launch operator. However, these requirements would be imposed by the FAA with/without the proposed rulemaking.
§417.235 Analysis for Launch of an Unguided Suborbital Rocket Not Using a Flight Safety System	Requires a launch operator to perform a flight safety analysis to determine the launch parameters and conditions under which an unguided suborbital rocket may be flown without a flight safety system [must demonstrate that adverse effects would be contained within controlled areas].	**Current practice at federal ranges** & the requirements would be imposed by the FAA with/ without the proposed rulemaking,

NPRM, Licensing and Safety Requirements for Launch [14 CFR Parts 401, 413, 415, 417] Comparison to Current Practice [Continued]

Part/Section	Summary	Comparison
Subpart D - Flight Safety System	Contains requirements applicable to a launch operator's flight safety system, the primary purpose of which is to prevent a launch vehicle from impacting populated or other protected areas in event of a launch vehicle failure.	Specific impacts, if there are any, are discussed in *§417.301* through *§417.343*.
§417.301 General	[a] Requires that a launch operator ensure that its flight safety system be designed, tested and operated in accord with Subpart D. Requires that a flight safety system consist of a FTS, command control system, and support systems. The FAA will evaluate other types of flight safety systems to determine if they provide equivalent levels safety. [b] Requires that in the event of a launch vehicle failure, a flight safety system must terminate the flight and prevent any hazards from impacting populated or other protected areas. [c] Requires launch operator to implement a test program for its flight safety system that demonstrates the ability of the flight safety system. [d] Requires a licensee to verify that its flight safety system remains as described in its license application.	**The requirements are based upon AF safety documents that describe current practice at the ranges** [i.e., requirements imposed by the federal range upon launch operators launching from federal ranges]. These documents, together with lessons learned from the AF, are codified in the proposed rulemaking. The requirements would be imposed by the FAA with/without the proposed rulemaking.
§417.303 Flight Termination System Functional Requirements	Requires that a launch operator develop and implement a flight termination system which, once initiated, would render each stage and any other propulsion system, including one which is part of a payload, with the capability of reaching a populated or other protected area, non-propulsive with zero lift and zero yaw. Also requires that a FTS include a command destruct system that is initiated by radio command. The FAA will evaluate the use of any other type of system in place of a command destruct system, such as an autonomous FTS on a case-by-case basis for an equal level of safety.	The FAA requirements codify requirements that are **current practice at the federal ranges** and would be required with/without the proposed rulemaking as demonstrated with the licensing of Sea Launch.
§417.305 Flight Termination System Reliability	Provides design requirements that a FTS must meet; requires that FTS have a reliability design of 0999; that a system analysis be performed to demonstrate the reliability design; that specific component and system testing be performed; that redundant components be structurally, electrically, and mechanically separated & mounted in different orientations on different axes; and that specified storage and operating lives be achieved.	**Current practice at federal ranges** and would be required with/without the proposed rulemaking.
§417.307 Flight Termination System Environment Survivability	Establishes requirements for ensuring that a FTS would survive when subjected to flight & other environments. The requirements are those established at federal ranges. The FAA also requires that the federal ranges' safety margins be added to maximum predicted environments obtained through analysis for launch vehicles, where there are not yet at least 3 samples of flight data.	**Current practice at federal ranges** and would be required with/without the proposed rulemaking.
§417.309 Command Destruct Sys.	Requires that a FTS include at least one command destruct system that is initiated by radio command and meets the redundancy and other component reqmts; adopts the federal launch ranges' requirement for a command destruct system.	**Current practice at federal ranges** and would be required with/without the proposed rulemaking. It should be noted that the FAA has not required Sea Launch to have an FTS since Sea Launch demonstrated to FAA's satisfaction that an alternative could provide the requisite level of safety.

NPRM, Licensing and Safety Requirements for Launch [14 CFR Parts 401, 413, 415, 417]
Comparison to Current Practice [Continued]

Part/Section	Summary	Comparison
§417.311 Inadvertent Separation Destruct System	Provides performance reqmts applicable to inadvertent separation destruct system: defines how it is to function and ensure its reliability.	**Current practice at federal ranges** and would be required with/without proposed rule making.
§417.313 Flight Termination System Safing and Arming	Provides performance requirements governing the safing and arming of a flight termination system. [a] Requires that design must provide for safing of all FTS ordnance through the use of devices that provide a removable and replaceable mechanical barrier for interrupting power to each ordnance firing circuit. [b] Requires, for a launch vehicle flown from land, for each FTS ordnance initiation device to be armed prior to arming any launch vehicle or payload propulsion ignition circuits. [c] Requires, for a launch vehicle flown from the air or sea, design to provide an ignition interlock that prevents the arming of any launch vehicle or payload propulsion ignition circuits unless all FTS ordnance initiation devices and arming devices are armed. [d] Requires FTS provide for remote redundant safing of all FTS ordnance initiation devices before launch and in case of launch abort or recycle operations. [e] Requires that hardware or software used to automatically safe FTS ordnance must be single fault tolerant against inadvertent safing. [f] Requires design of FTS provide for remote monitoring of the safe and arm status of each FTS ordnance initiation and arming device.	The requirements of *§417.313(a)* through *§417.313(f)* are all **current practice at federal ranges** and would be required by the FAA with/without the proposed rulemaking.
§417.315 Flight Termination System Testing	Provides general requirements applicable to all testing of a FTS or its components and would require all FTS components to be subjected to a comprehensive test program.	The required test progam is **patterned after the approach developed at the federal range, is current practice** and would be implemented with/without the proposed rulemaking.
§417.317 Flight Termination System Preflight Testing	Provides a broad range of requirements for preflight component tests to be conducted following qualification and acceptance testing to detect changes in performance that may result from shipping, storage, or other environments, and identify what system tests a launch operator must conduct immediately prior to flight.	The requirements were developed based on requirements traditionally used and considered to be **current practice by at federal ranges**. The FAA requirement would be imposed with/without the proposed rulemaking.
§417.319 Flight Termination System Installation Procedures	Establishes FTS installation procedures to both ensure correct installation of FTS components so they work as intended and ensure that personnel performing tasks are qualified for the task.	**Based on procedures developed at federal ranges** and would be implemented by the FAA with/without the proposed rulemaking.
§417.321 Flight Termination System Monitoring	Requires monitor consoles include all communications & monitoring capability necessary to ensure the status of a FTS can be ascertained and relayed to the appropriate launch officials. Also requires launch operator establish pass/fail criteria for monitored FTS data to support launch abort decisions and ensure a FTS is performing as expected. Abort criteria would be submitted for FAA approval.	**Based on requirements developed and utilized at federal ranges** and would be implemented by the FAA with/without the proposed rulemaking.

NPRM, Licensing and Safety Requirements for Launch [14 CFR Parts 401, 413, 415, 417] Comparison to Current Practice [Continued]

Part/Section	Summary	Comparison
§417.323 Command Control System Requirements	[a] Presents a general description of requirements.	Presents a general description of requirements.
	[b] Requires that the command control system be compatible with the FTS onboard the launch vehicle.	**Current practice at federal ranges** and would be required with/without the proposed rulemaking.
	[c] Requires command control system to have a reliability design of 0.999 and requires its demonstration through analysis.	**Current practice at federal ranges** and would be required with/without the proposed rulemaking.
	[d] Requires a configuration management and control plan to govern the command control system.	**Current practice at federal ranges** with the range taking care of this function. The proposed rule-making will shift this function to launch operator, but since this would be the case with/without the proposed rule-making there are no impacts.
	[e] Requires command control system to satisfy specific performance requirements including that a transmitter must operate at a radio carrier frequency authorized for use by the launch operator.	**Current practice at federal ranges** and would be required by the FAA with/without the proposed rulemaking.
§417.325 Command Control System Testing	Establishes test requirements for a command control system.	**Based on federal launch range qualification testing requirements**. These are considered as **current practice** and would be used with/without the proposed regulation.
§417.327 Support Systems	[a] Requires a flight safety system to include support sys: vehicle tracking, visual data source, telemetry comm., data display and data recording systems & requires these support systems be compatible. [b] Requires vehicle tracking system provide continuous position & status data from lift-off until launch vehicle reaches orbit or can no longer reach any populated or other protected area. [c] Requires visual tracking. [d] Requires a telemetry system that provides continuous flight safety data during preflight operations, lift-off, & during flight until the launch vehicle reaches orbit or can no longer reach any populated or protected area. [e] Requires a communications system that connects all flight safety functions with all launch control centers and down range stations. [f] Requires a flight safety data processing, display and recording system that displays and records data for the flight safety official to monitor a launch. [g] Requires a flight safety console containing displays and controls to monitor and evaluate launch vehicle performance and for flight safety official to communicate with other flight safety and launch personnel. [h] Requires a launch operator to calibrate its support systems to ensure that measurement and monitoring devices provide accurate indications.	**Current practice at federal ranges** and would be required by FAA with/without the proposed rulemaking. [b] Historically, the federal ranges have required three sources of tracking data but if one source were to fail just prior to launch the launch would be allowed to continue with no less than two sources.

NPRM, Licensing and Safety Requirements for Launch [14 CFR Parts 401, 413, 415, 417]
Comparison to Current Practice [Continued]

Part/Section	Summary	Comparison
	[i] Requires launch operator to use a destruct initiator simulator to simulate initiation of a destruct action during the FTS preflight tests. [j] Requires a launch operator's flight safety system to include a timing system synchronized with the US Naval Observatory in Washington, DC.	
§417.329 Flight Safety System Anal.	Requires launch operator to perform prescribed systems analyses to verify that the launch operator's FTS and command control systems and components meet the reliability requirements.	**Considered as current practice.** The analyses are to be performed using standard industry system safety and reliability analysis methodologies. Guidelines for these analyses are contained in FAA Advisory Circular AC 431.35-1, September 2000 Would be required with/without proposed rulemaking.
§417.331 Flight Safety Crew Roles and Qualifications	Requires a flight safety system to be operated by a flight safety crew made up of a flight safety official & support personnel possessing qualifications and performing the roles, of functions, defined in this section for each flight safety crew position. An individual flight safety crew member may perform the roles of more than one position provided all required roles and associated tasks are accomplished.	The identified flight safety crew safety crew positions and roles are based on the approach used at the federal ranges and would be required with or without the proposed rules. The FAA's safety crew qualification requirements depend on experience and on-the-job training where the federal ranges have senior people who are responsible for training and qualifying crew personnel.
Subpart E - Ground Safety	Contains the FAA's proposed safety requirements for launch processing typically referred to as ground safety.	Impacts, if any, are discussed in *§417.401* through *§417.417.*
§417.401 Scope	Contains public safety requirements that would apply to the preflight preparation of a launch vehicle and related post-launch activities at a US launch site.	Impacts, if any, are discussed in *§417.401* through *§417.417.*
§417.403 General	Requires launch operator ensure that the hazard controls necessary to protect the public are in place, that launch operator perform a ground safety analysis, implement a ground safety plan and conduct launch processing according to any local agreements. Also requires launch operator to keep its ground safety plan current and provide FAA any changes no later than 30 days before that change is implemented.	The FAA's proposed requirements are **based upon current practice at the federal ranges**. The FAA's concern is with public safety & would establish the requirements based upon current practice with/without the proposed rulemaking.
§417.405 Ground Safety Analysis	Requires a launch operator to perform a ground safety analysis to demonstrate whether its launch vehicle hardware and launch processing present public hazards and that this is performed by a technically competent person. Also requires the identification of all hazards of each launch vehicle system and launch processing operation. Requires that any system that presents a public hazard be single fault tolerant, that the launch operator implement hazard areas and safety clear zones for public hazards and launch location hazards to ensure that any public is kept at a safe distance, that a ground safety analysis identify all hazard causes and controls to be implemented and verifiable and to document its ground analysis in a ground safety analysis report.	The FAA's proposed requirements are **based upon current practice at the federal ranges**. The FAA would establish the requirements based upon current practice with/without the proposed rulemaking.

NPRM, Licensing and Safety Requirements for Launch [14 CFR Parts 401, 413, 415, 417]
Comparison to Current Practice [Continued]

Part/Section	Summary	Comparison
§417.407 Hazard Control Implementation	Requires a launch operator to implement hazard controls and inspections to ensure that hazard controls are in place and no unsafe conditions exist and that procedures and developed and implemented for the receipt, storage, use, and disposal of hazardous materials including toxic substances and any sources of ionizing radiation.	The FAA's proposed requirements are **based upon current practice at the federal ranges**. The FAA would establish the requirements based upon current practice with/without the proposed rulemaking.
§417.409 System Hazard Controls	[a] Requires a launch operator to implement the hazard controls identified through ground safety analysis. [b] Requires that any safety factor applied in the design of a structure or material handling equipment take into account static and dynamic loads, environmental stresses and expected wear. [c] Requires a launch operator to test and inspect a flight or ground pressure vessel to ensure that no critical flaws exist. [d] Requires electrical and mechanical systems to be single fault tolerant. [e] Requires propulsion systems to be dual fault tolerant to prevent inadvertent propulsion. [f] Requires an ordnance system to be at least single fault tolerant to prevent inadvertent actuation.	The FAA's proposed requirements are **based upon current practice at the federal ranges**. The FAA would establish the requirements based upon current practice with/without the proposed rulemaking.
§417.411 Safety Clear Zones for Hazardous Operations	Requires establishment of safety clear zone for hazardous operations and requires launch operator to provide positive control over a safety clear zone to ensure no public access during hazardous operations.	The FAA's proposed requirements are **based upon current practice at the federal ranges**. The FAA would establish the requirements based upon current practice with/without the proposed rulemaking.
§417.413 Hazard Areas	[a] Requires launch operator define a hazard area within which any adverse effects will be confined should an actuation or other undesirable hazardous event occur. [b] Requires a launch operator to implement a process for authorizing public access on an individual basis. [c] Requires launch operator to implement procedural controls that preclude any hazardous operation from taking place while members of the public have access to the launch location.	The FAA's proposed requirements are **based upon current practice at the federal ranges**. The FAA would establish the requirements based upon current practice with/without the proposed rulemaking.
§417.415 Post-Launch & Post-Launch Attempt Hazard Controls	[a] Requires a launch operator to implement procedures for controlling hazards and returning the launch facility to a safe condition after a successful launch attempt. [b] Requires a launch operator to implement procedures for controlling hazards associated with failed launch attempts where a solid or liquid launch vehicle engine start command was sent, but the launch vehicle did not liftoff. [c] Requires a launch operator to implement procedural controls for hazards associated with an unsuccessful launch attempt where the launch vehicle has a land or water impact.	The FAA's proposed requirements are **based upon current practice at the federal ranges**. The FAA would establish the requirements based upon current practice with/without the proposed rulemaking.
§417.417 Propellants and Explosives	Requires a launch operator to comply with the explosive safety criteria in 14 CFR Part 420 and to implement procedures for the receipt, storage, handling and disposal of explosives, and procedural system controls to preclude inadvertent initiation of explosives and propellants.	This is a codification which **mirrors the current practice by the federal ranges**. This would be required by the FAA with/without the proposed rulemaking.

NPRM, Licensing and Safety Requirements for Launch [14 CFR Parts 401, 413, 415, 417] Comparison to Current Practice [Continued]

Part/Section	Summary	Comparison
§417.418 - 417.500 [Reserved]	Sections reserved for future use.	N/A
Part 417 Appendix A, Methodology for Determining Flight Hazard Areas for Orbital Launch	Provides methodologies and equations to be used in in determining flight hazard areas as part of the flight hazard area analyses required in *§417.225*. Alternative methodologies could be used if approved by the FAA during the launch licensing process. **Allows launch operator to use alternate analyses of an equivalent level of safety.**	This is a codification which **mirrors the current practice by the federal ranges**. The methodologies would be required with/without the proposed rulemaking.
Part 417 Appendix B, Methodology for Determining Expected Casualty	Describes the methodology that would be required for calculating expected casualty [E_c] as part of a debris risk analysis as required in *§417.227*. **Allows launch operator to use alternate analyses of an equivalent level of safety.**	This is a codification which **mirrors the current practice by the federal ranges and the FAA**. This requirement was imposed on Sea Launch as part of the licensing process. The methodology would be required with/without the proposed rulemaking.
Part 417 Appendix C, Flight Safety Analysis for an Unguided Suborb. Rocket not Using a Flight Safety System	Describes methodologies for performing the flight safety analysis for the launch of an unguided suborbital sounding rocket. **Allows launch operator to use alternate analyses of an equivalent level of safety.**	This is a codification which **mirrors the current practice by the federal ranges** [Wallops & White Sands]. The methodology would be required with/without the proposed rulemaking.
Part 417 Appendix D, Flight Termination System Components	Presents requirements that apply to specific components of a flight termination system.	The requirements were **developed based on requirements traditionally used at federal ranges**; however these were not adopted in total. The FAA worked with AF to refine the requirements to a performance level that eliminates the use of design solutions as requirements. The approach would be utilized with/ without the proposed rulemaking. The use of performance requirements may lead to cost savings but this would result with/without the current rulemaking.
Part 417 Appendix E, Flight Termination System Component Testing and Analysis	Establishes testing requirements applicable to specific flight termination system components.	The requirements were **developed based on requirements traditionally used at federal ranges**; however these were simplified. The FAA worked with the AF to refine the requirements to a performance level that eliminates the use of design solutions as requirements. The approach would be utilized with/ without proposed rulemaking and was already employed in the Sea Launch licensing process.
Part 417 Appendix F, Flight Termination System Piece Part Reqmts.	Establishes requirements for ensuring the quality of electronic piece parts used in flight termination system electronic components.	The requirements were **developed based on current AF range practice**. The approach would be utilized with/ without the proposed rulemaking.

NPRM, Licensing and Safety Requirements for Launch [14 CFR Parts 401, 413, 415, 417]
Comparison to Current Practice [Continued]

Part/Section	Summary	Comparison
Part 417 Appendix G, Natural and Triggered Lightning Flight Commit Criteria	Establishes flight commit criteria that protect against natural and triggered lightning during the flight of a launch vehicle.	**Current practice.** The criteria were developed by a Lightning Advisory Panel chartered by NASA & the AF. NASA and the AF have adopted these criteria. The criteria had to be rewritten using regulatory language. These criteria would be utilized with/without the proposed rule.
Part 417 Appendix H, Safety Critical Computing Systems & Software	Establishes safety requirements for all flight and ground systems for computing systems that perform software critical functions.	Codification of **current practice at the Air Force launch ranges**. These are considered as current practice and would be utilized with/without proposed rulemaking.
Part 417 Appendix I, Methodologies for toxic release hazard analysis	Provides the methodology that would be required for performing toxic release hazard analysis for flight for flight of a launch vehicle and launch processing at a launch site in the United States. **Allows launch operator to use alternate analyses of an equivalent level of safety**.	**Provides a functional equivalent to that which is practiced at the federal ranges**.